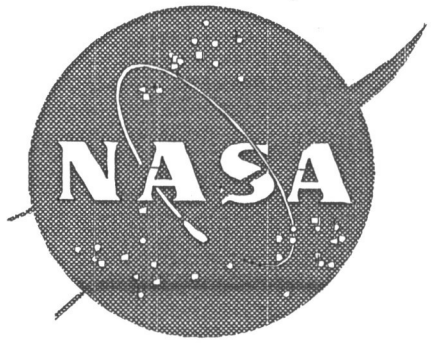
OHIO UNIVERSITY

2005

AUTOMATIC IDENTIFICATION & DATA CAPTURE
TECHNICAL INSTITUTE

Technologies on the Horizon for Product Identification



Fred Schramm

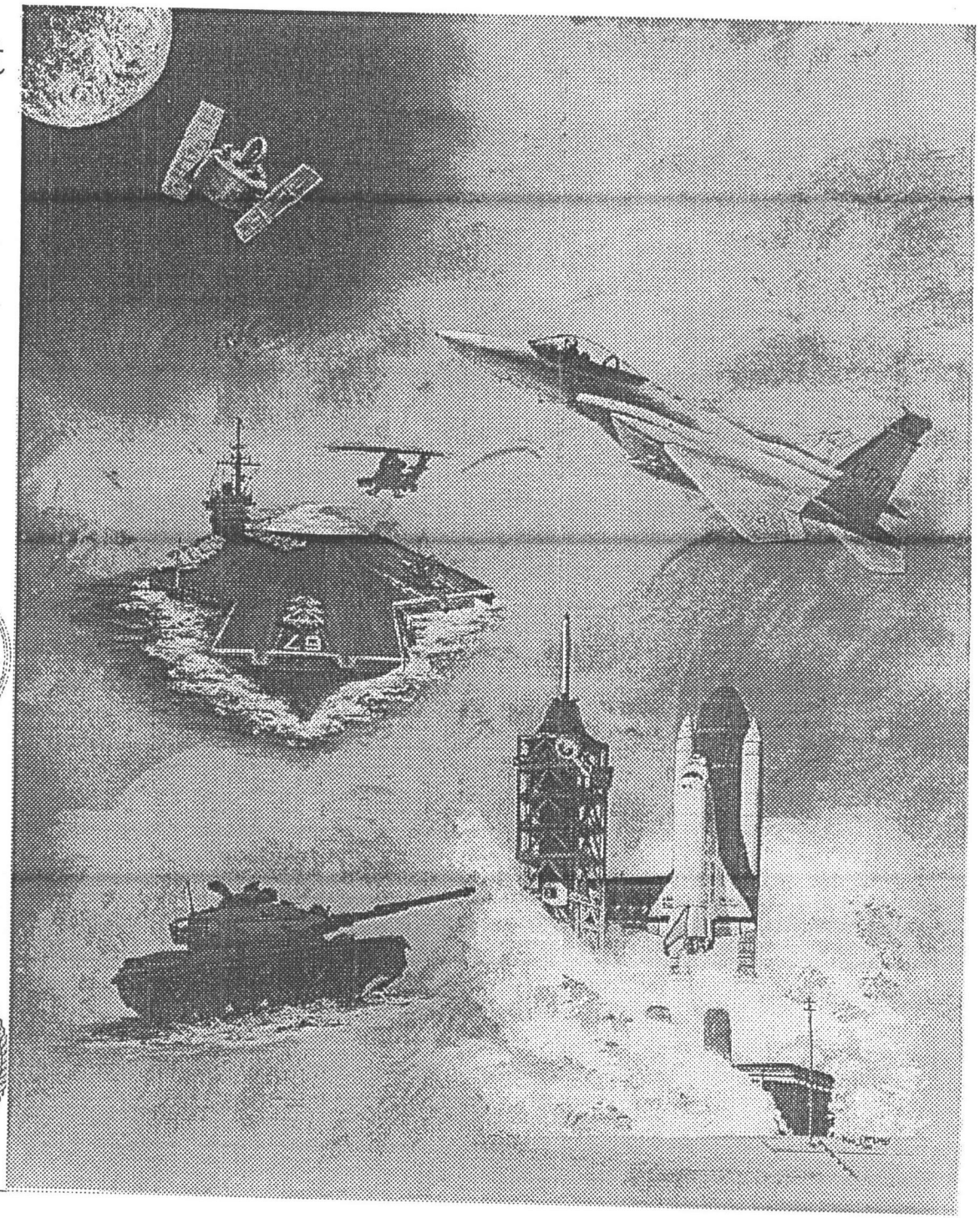
Technology Transfer Department

NASA Marshall Space Flight Center

July 29, 2005


NASA Thanks Those Who
Protect Our Freedom

Industry and Government Track Parts



Different Organizations Track Parts for Different Reasons

Ford

GM

NASA

DAIMLERCHRYSLER

TREAD ACT

Configuration Management

Readiness

UID

NHTSA
People Saving People
www.nhtsa.dot.gov

TREAD Act:
Early Warning
Reporting

The Perfect Storm

November 1, 2000

Transportation Recall Enhancement, Accountability, and Documentation Act (TREAD Act)

Ford Aware of Venezuela Tire Defect in 1998

■ **Safety:** The auto maker and Bridgestone/Firestone also are under siege from the Florida attorney general.

From Times Wires and Staff Reports

CARACAS, Venezuela—Ford Motor Co. said Tuesday that its first report of problems with Firestone tires on Explorer sport-utility vehicles in Venezuela came in 1998—two years before it began replacing

Ford Had Data On Tire Safety, Records Show

By Stephanie Simon
And Joseph B. White
Staff Reporters of The Wall Street Journal

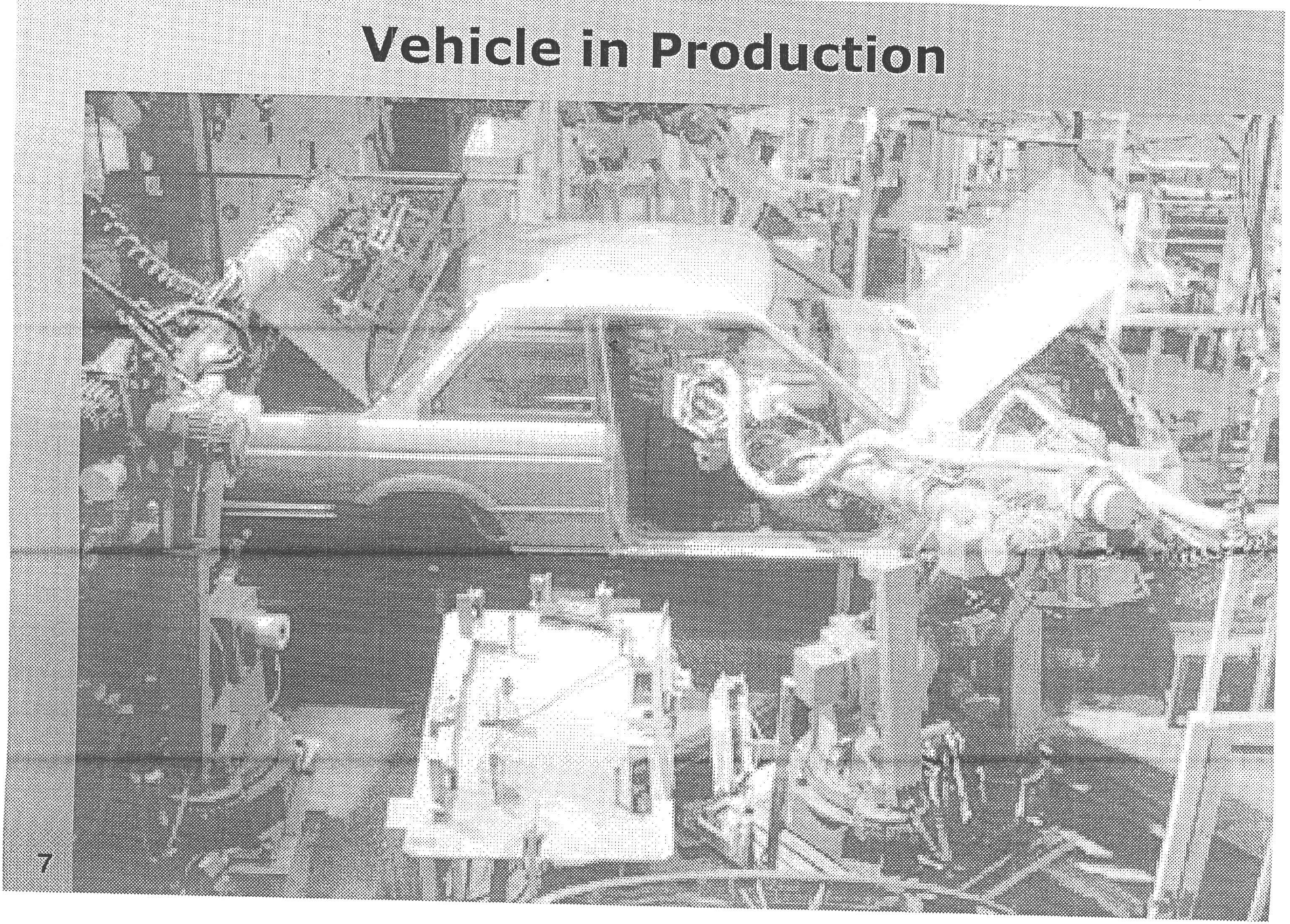
WASHINGTON—Ford Motor Co. documents indicate that company officials had data that Firestone tires installed on Ford-brand sport-utility vehicles had little or no margin for safety at top speed driving at the tire pressure Ford recommended.

The papers were part of a collection of documents that congressional investigators released late yesterday ahead of [illegible]

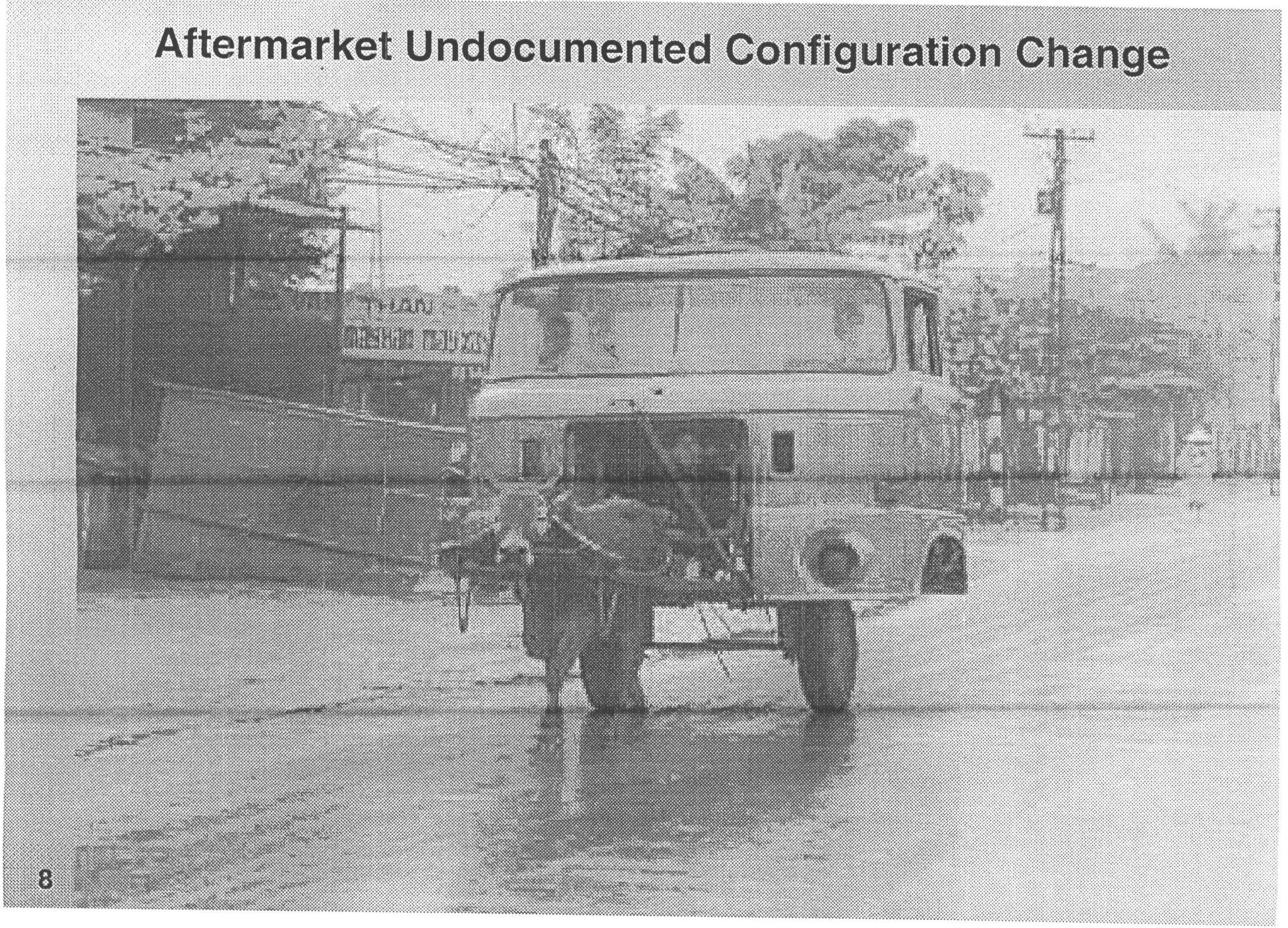
TREAD Act
Components/Systems to Report

- Steering
- Suspension
- Service brakes
- Parking brakes
- Engine and cooling system
- Fuel system integrity
- Power train
- Electrical system
- Lighting
- Visual systems
- Climate control including defroster
- Airbags and related components
- Seatbelts and related components
- Seat
- Engine speed control
- Integrated child restraints
- Latches
- Tires
- Wheels
- Trailer hitches

Vehicle in Production



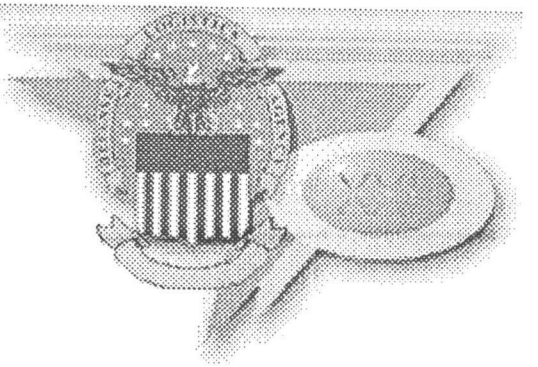
Aftermarket Undocumented Configuration Change



Unique Item Identifier (UID)

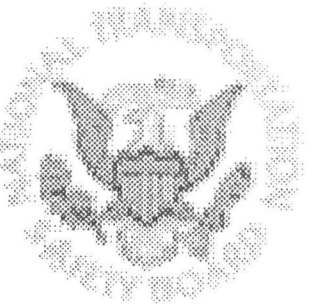








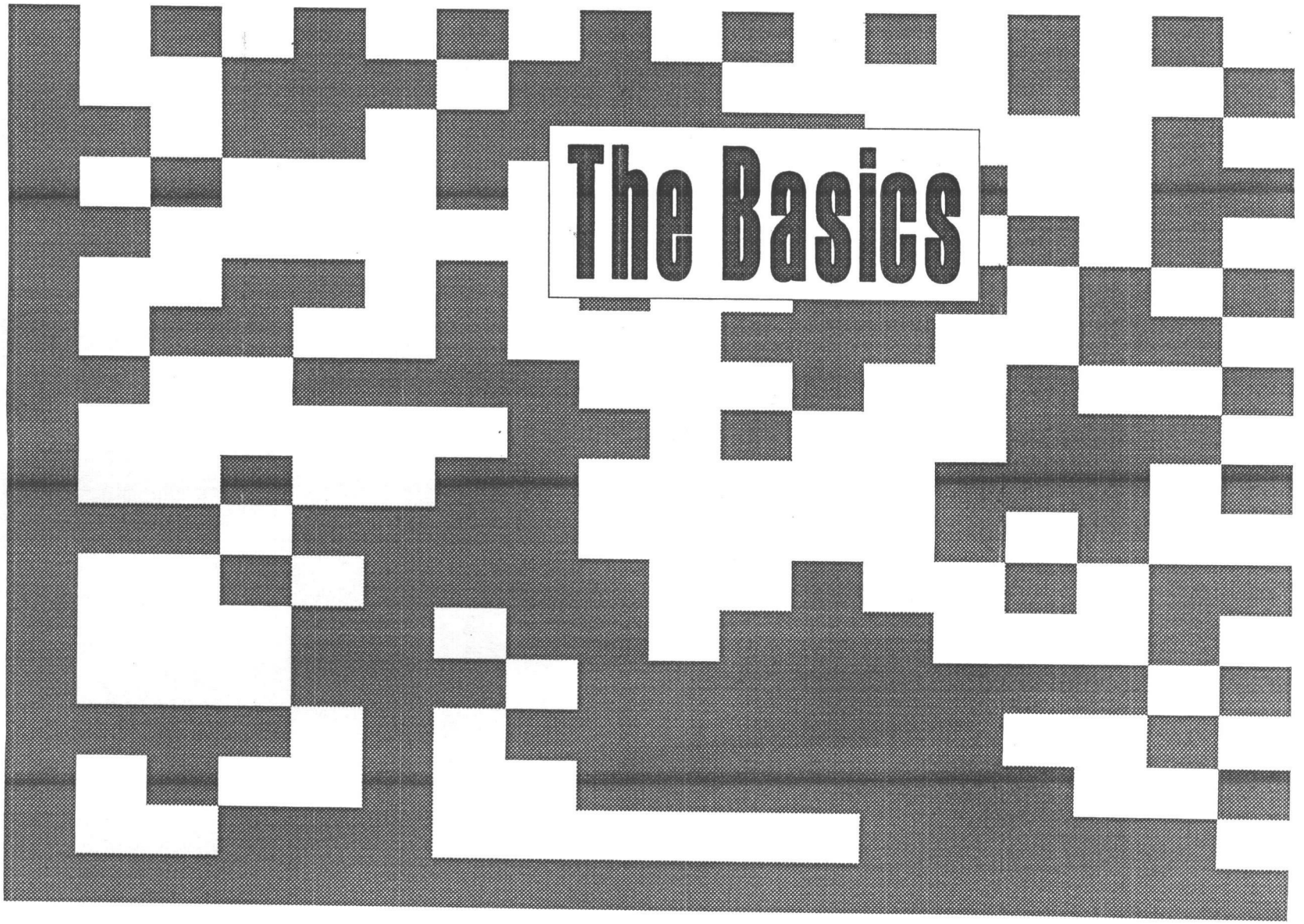






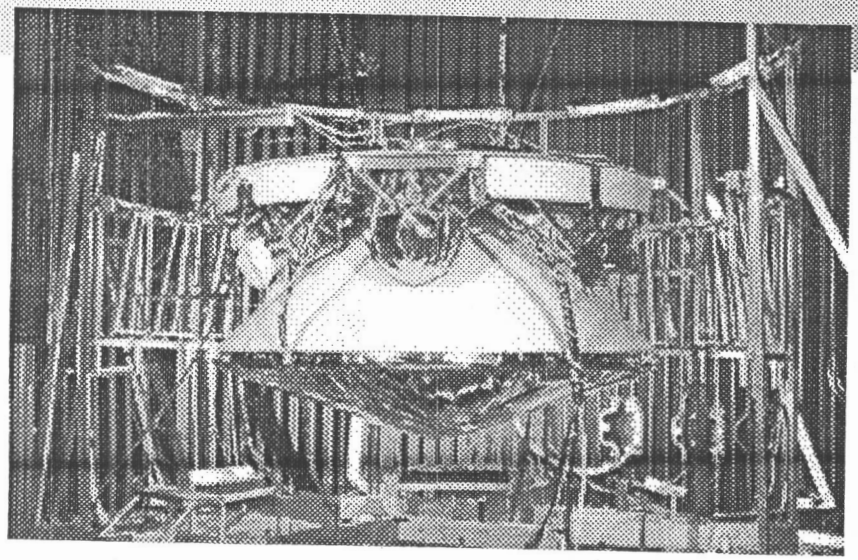


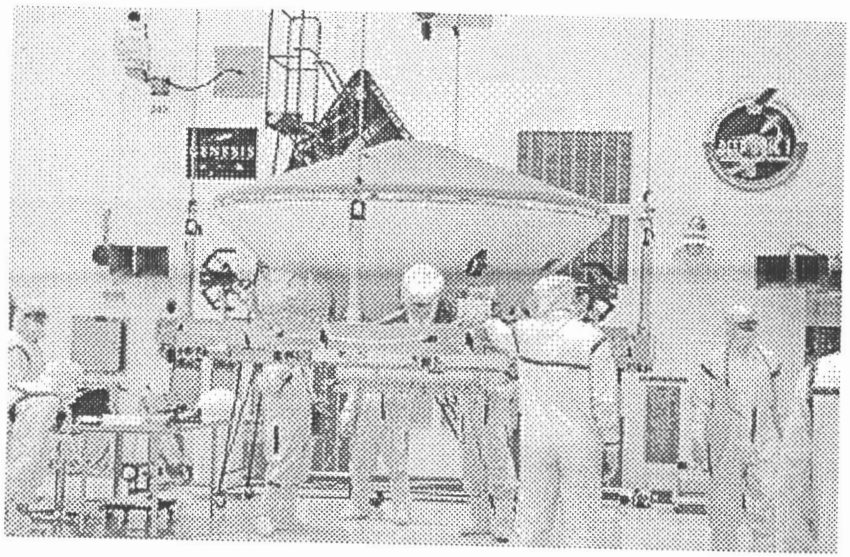
Unique Identification 101

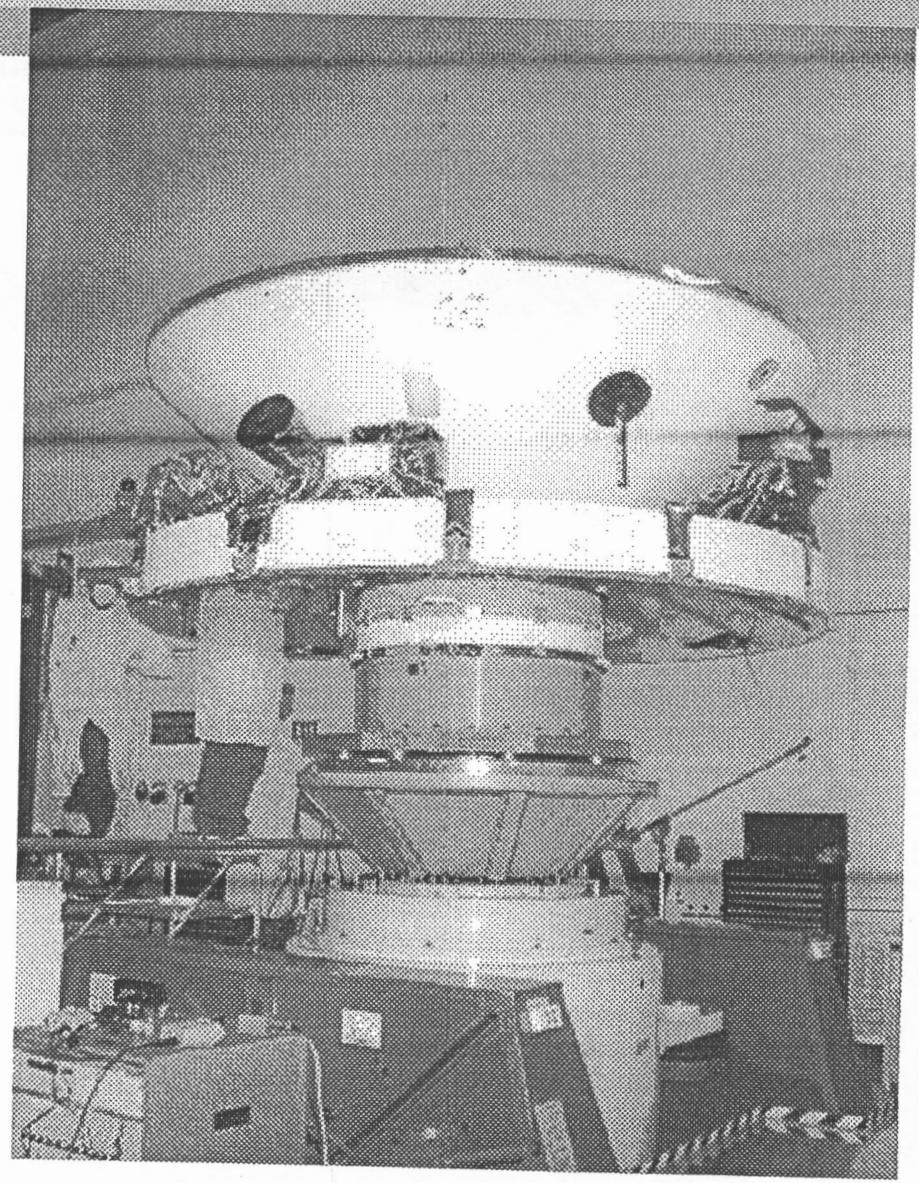



Logistics
Inventory Control
Tracking Movement
Product ID
Networks
Databases
Authentication Technologies
Reports
Auto ID Standards
But These Are Enablers in the Environment Through Which a Product Progresses

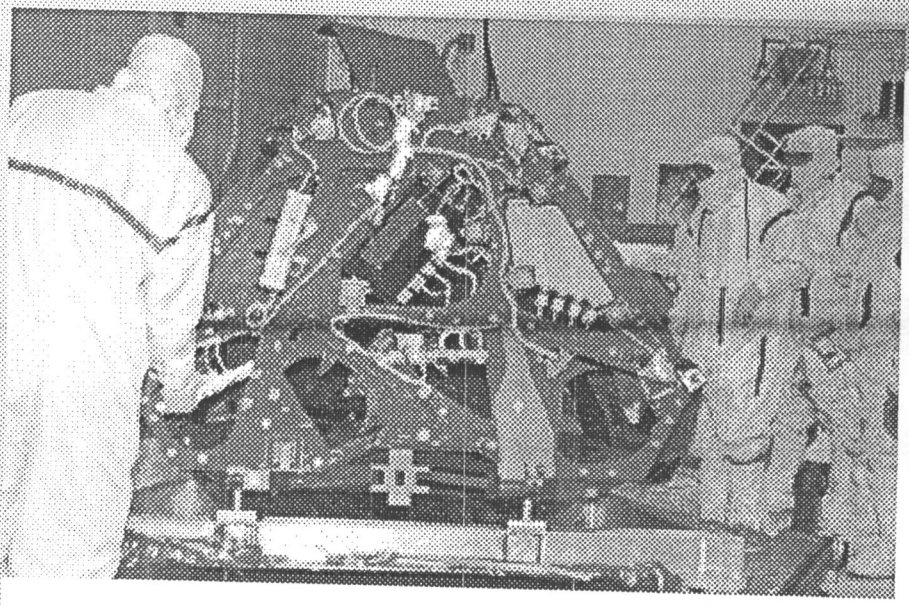
New Delivery System Was Required

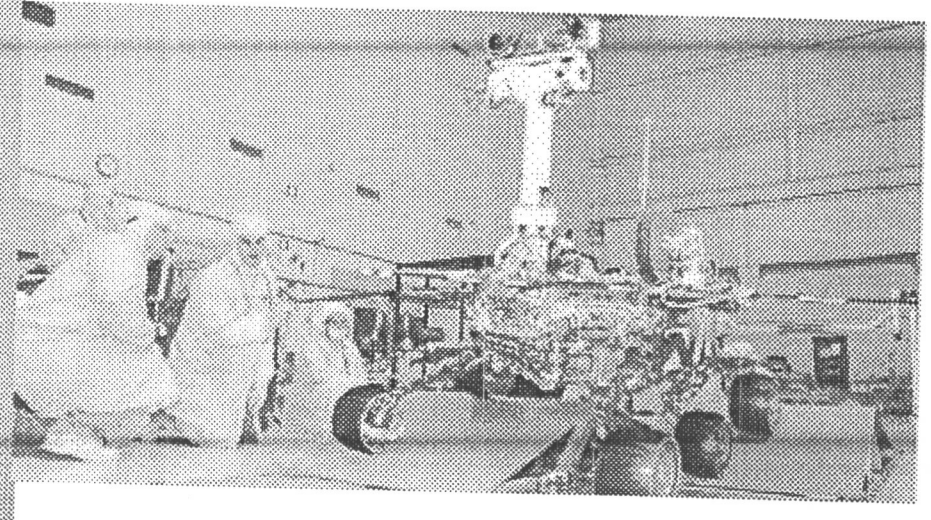


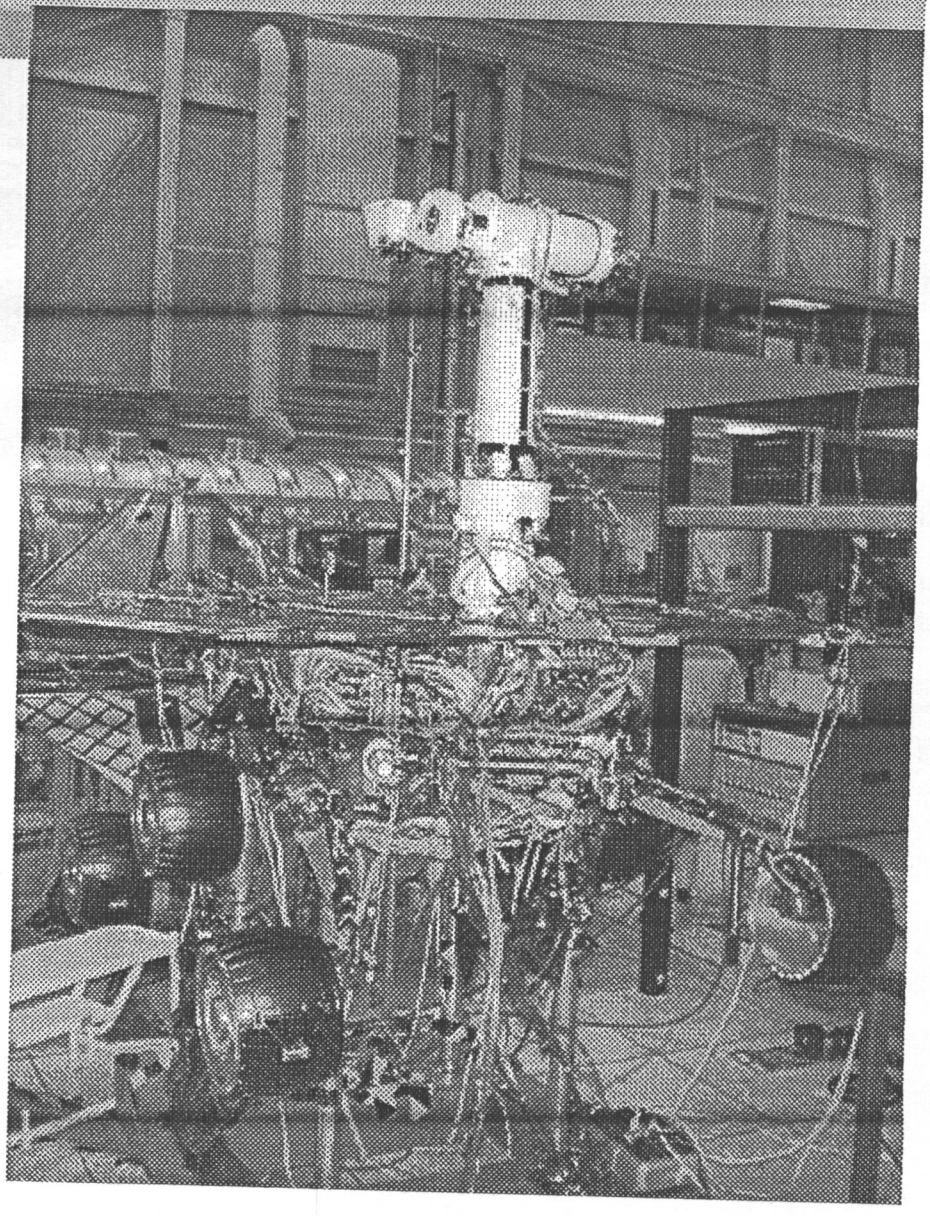




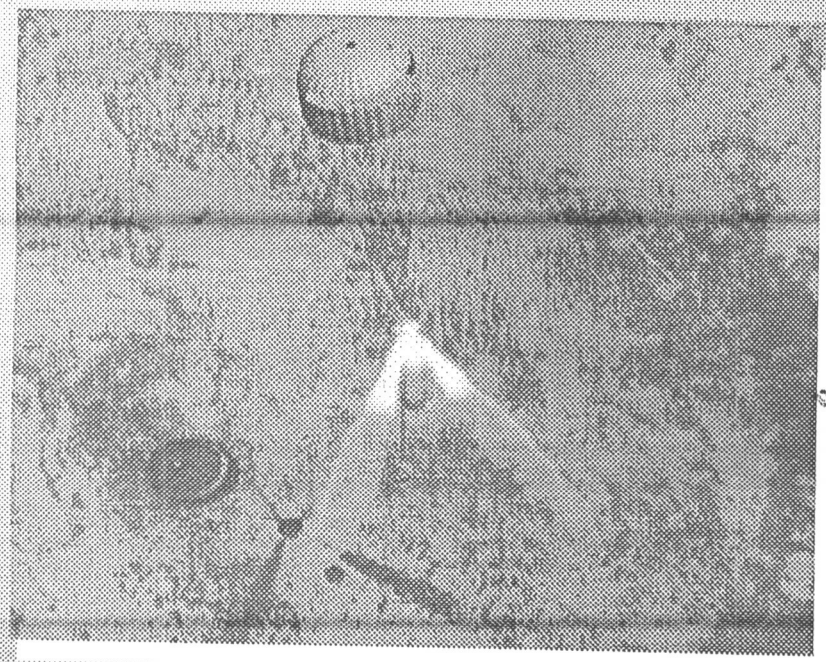
New SUV Was Produced

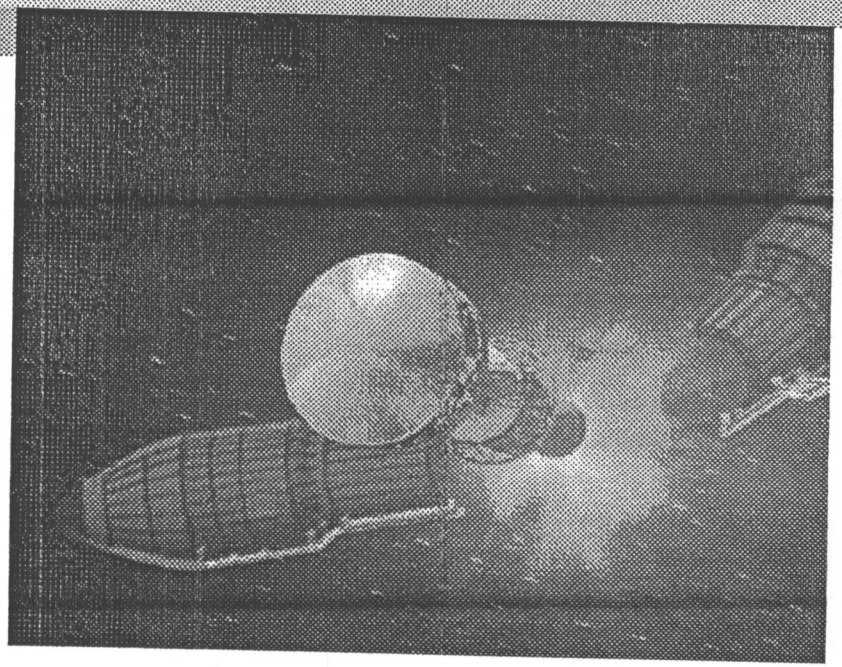


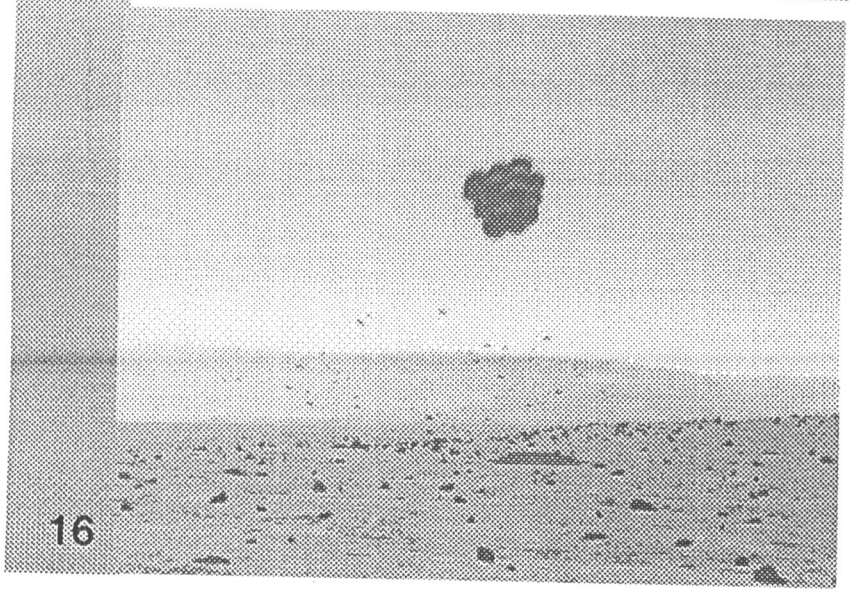




Revolutionary New Brake System



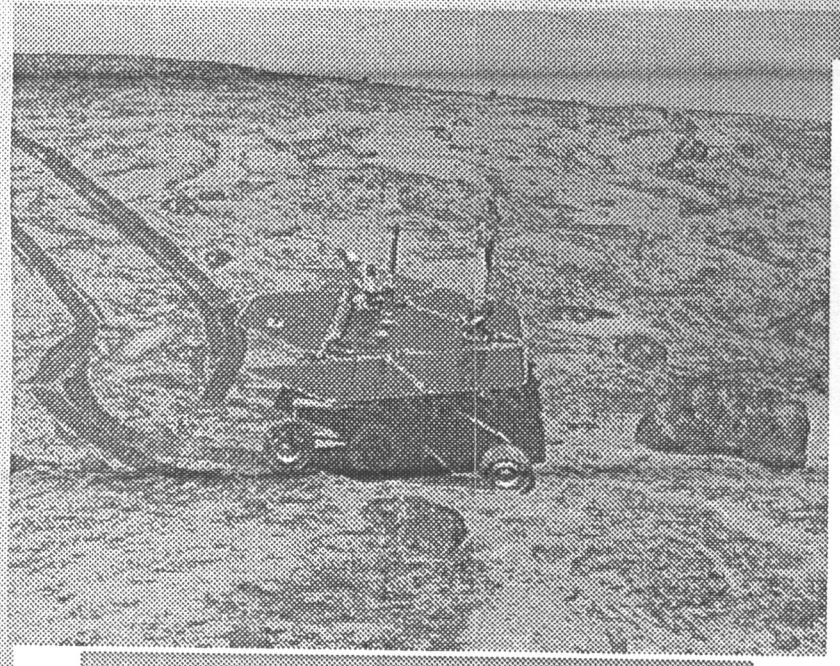


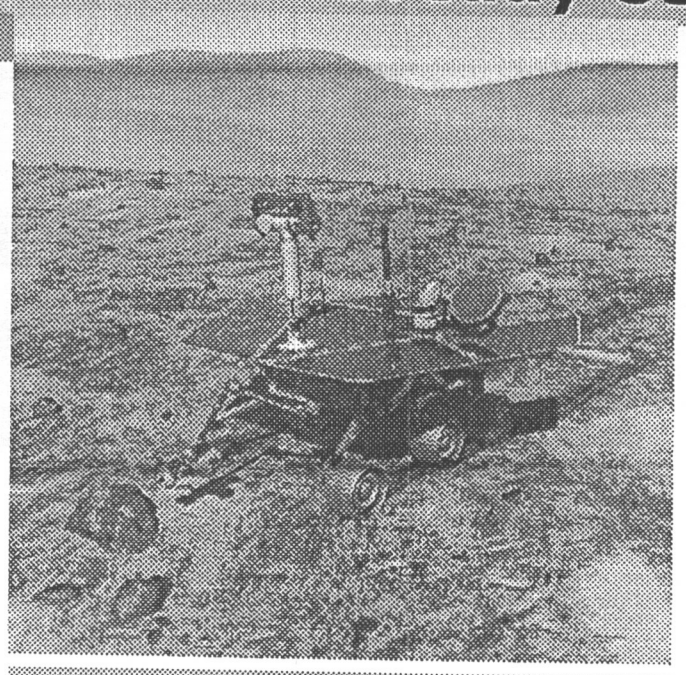


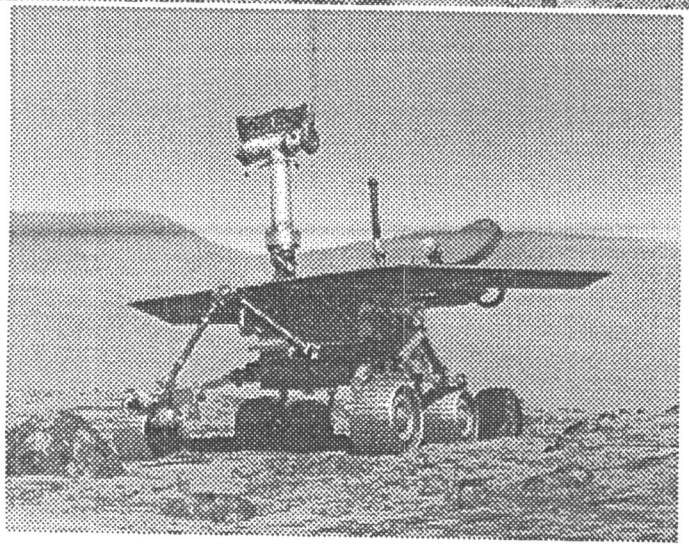
Revolutionary New Shocks, Too

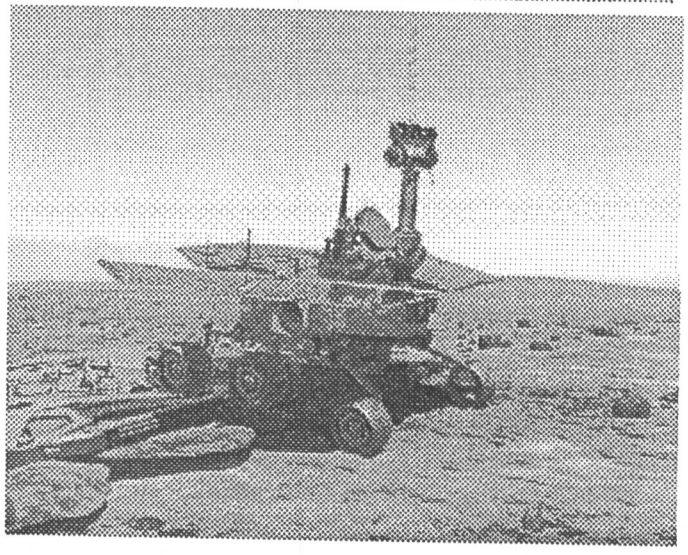
Use Once and Discard

Catchy Name—Mars Rover
"Land Rover" and "Range Rover" Already Used





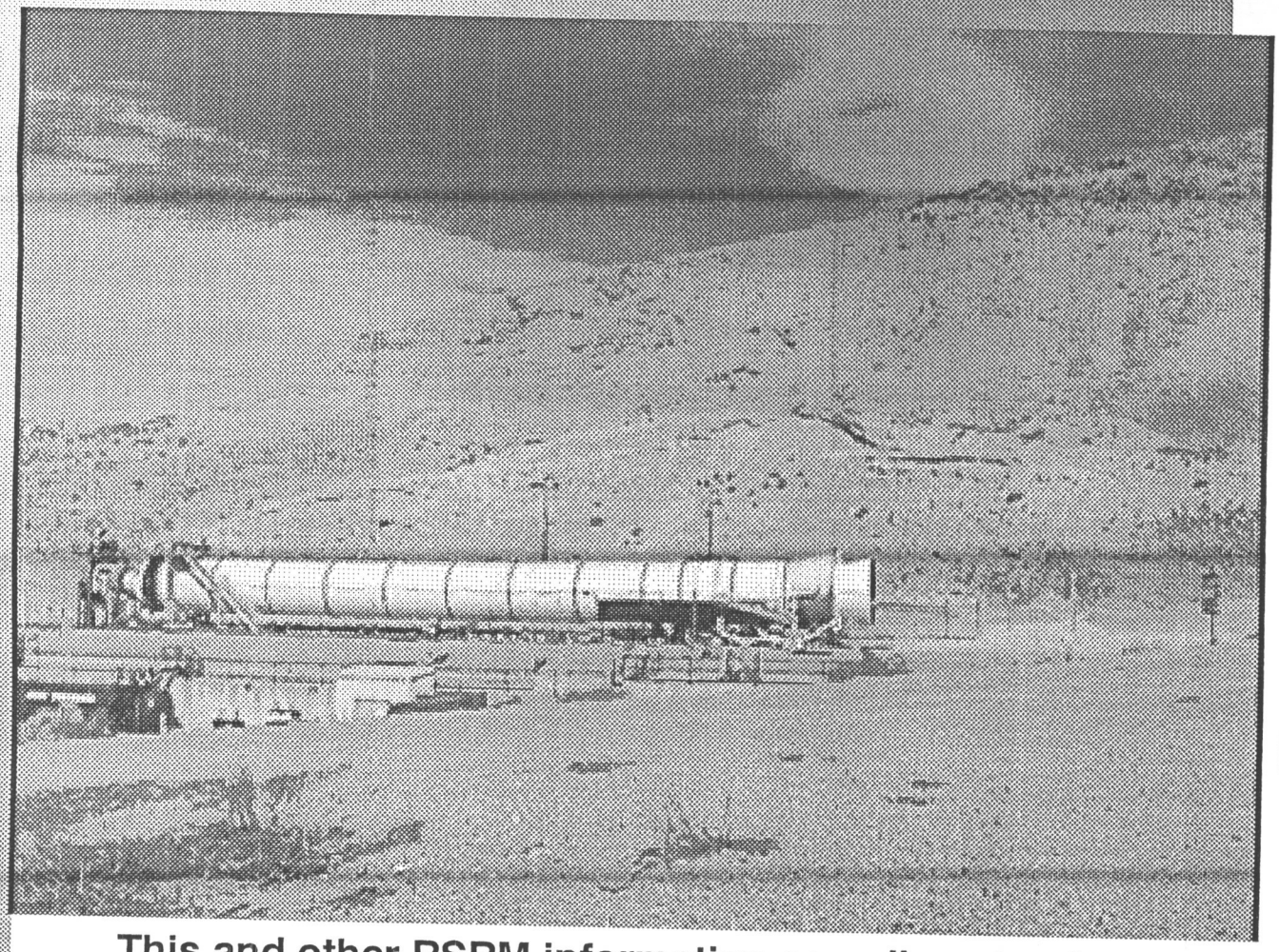




Traceability of Critical Parts
Why It Is Important To NASA

- Design Safety Factor of 1.4+
- Continued Testing to Validate Safety Factor
- Fleet Leader Condition (What Is Failing)
- Where Are All the Parts Like the Failed One
- How Do Only the Bad Ones Get Replaced

Traceability of Critical Parts
Test for Life Extension



Learn to Test

Test to Learn

Failures Provide

Recall Information

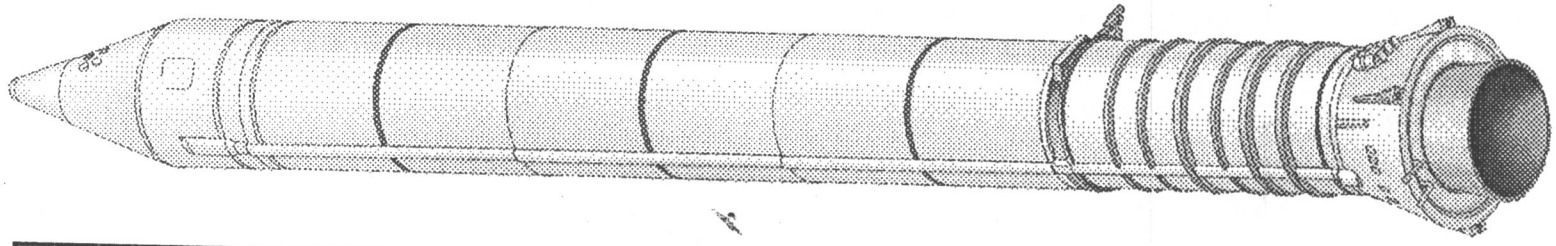
This and other RSRM information compliments of:

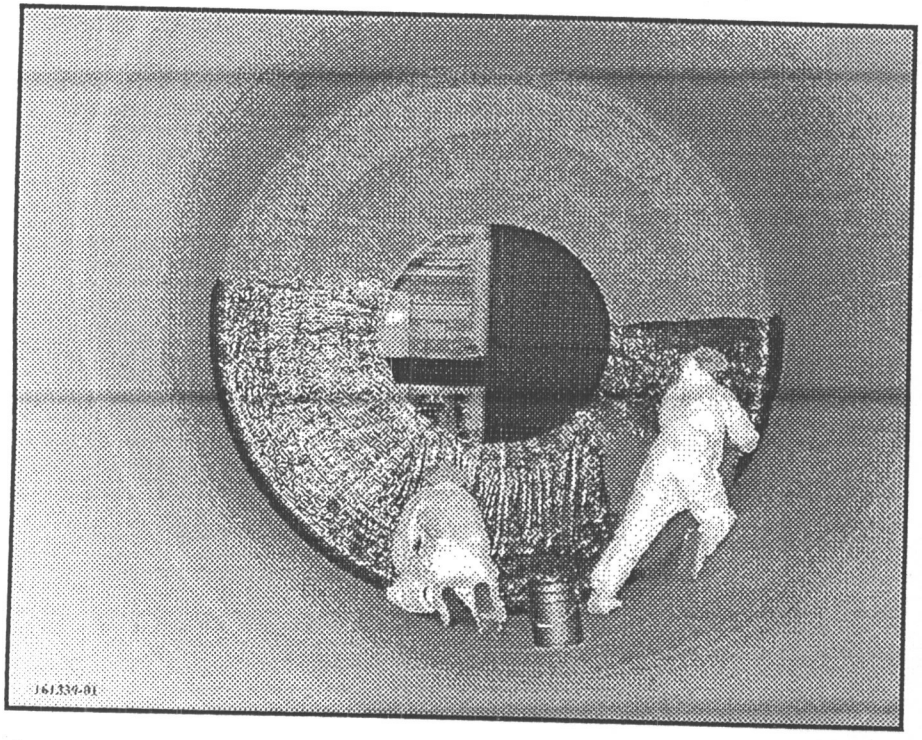
ATK
ALLIANT TECHSYSTEMS

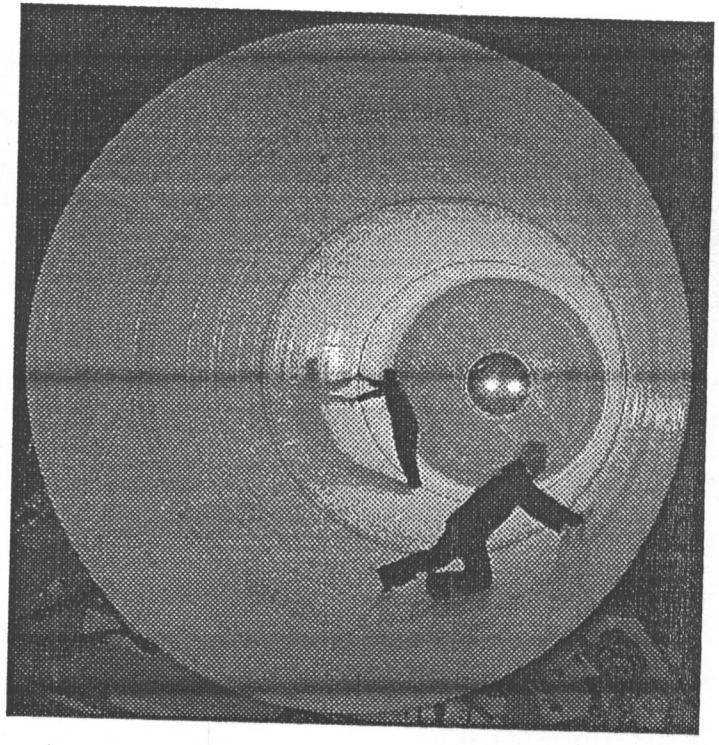
ATK THIOKOL PROPULSION

Traceability of Critical Parts

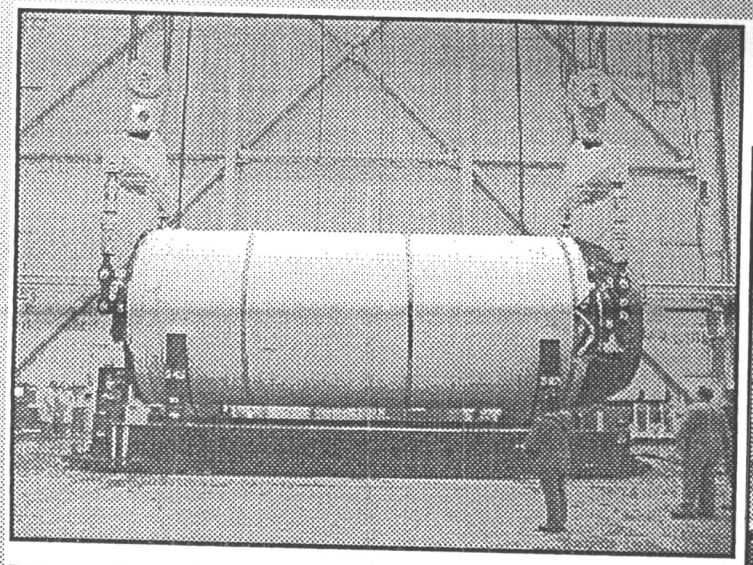
Reusable Solid Rocket Motor

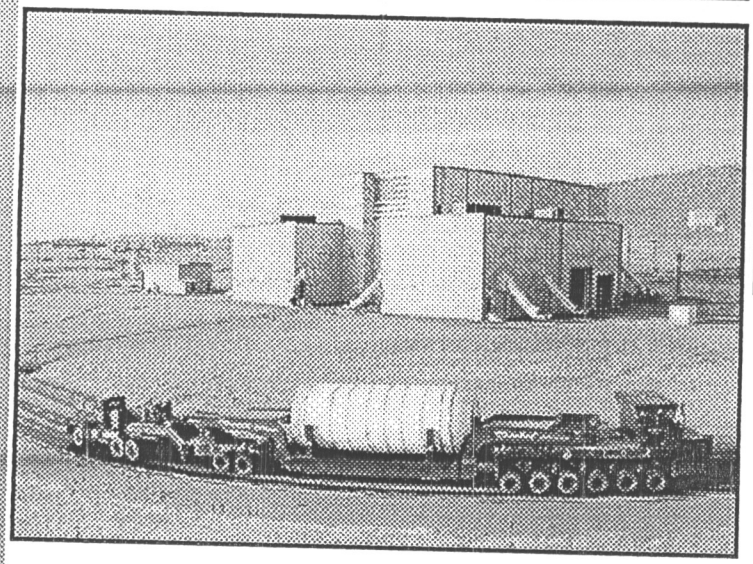


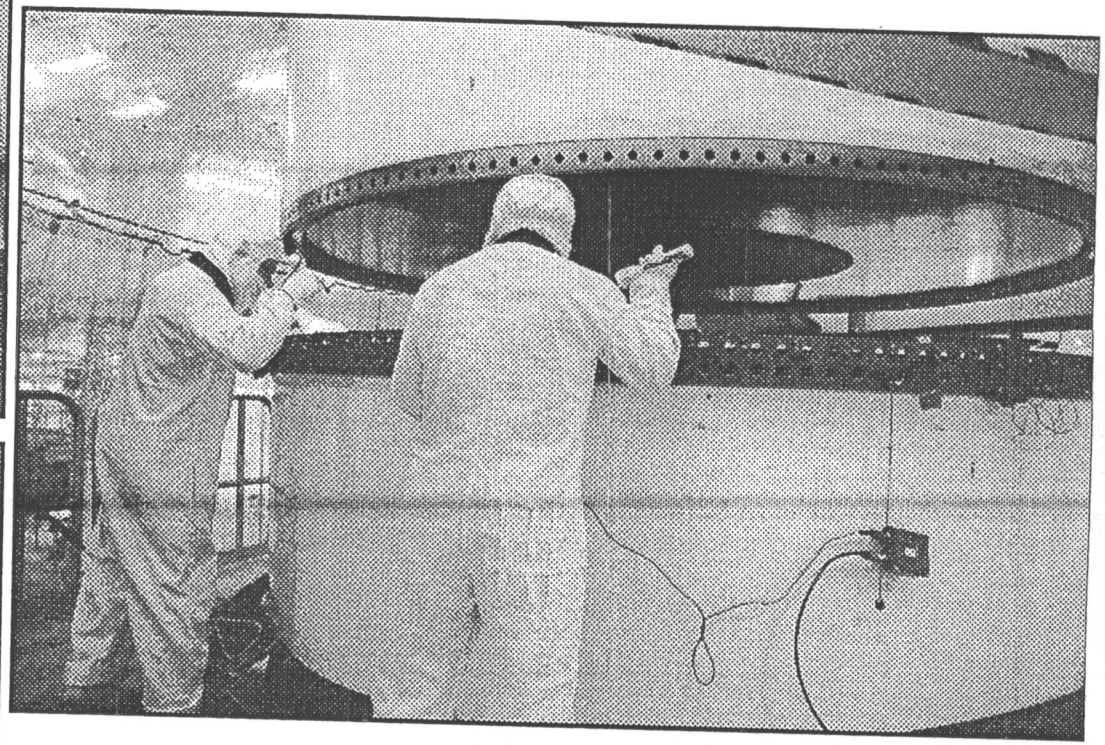




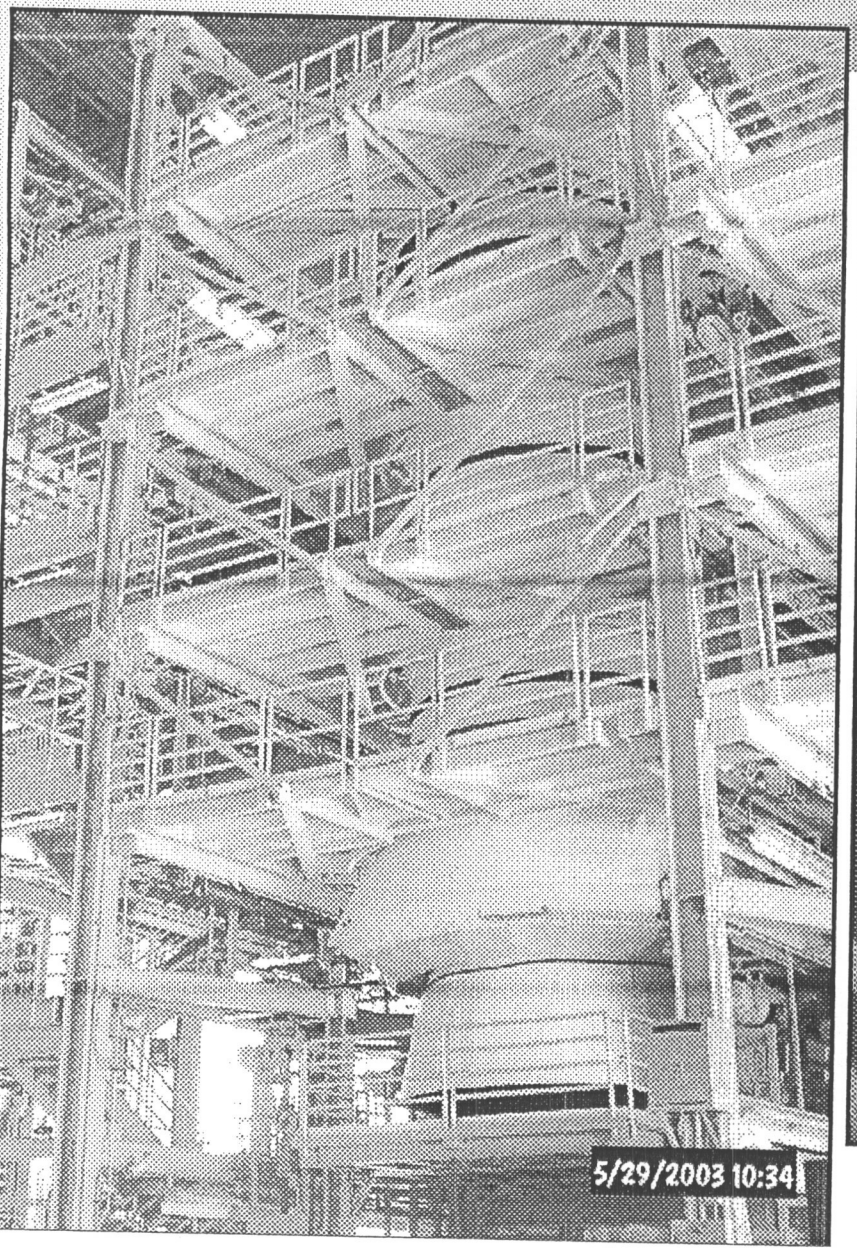
Traceability of Critical Parts

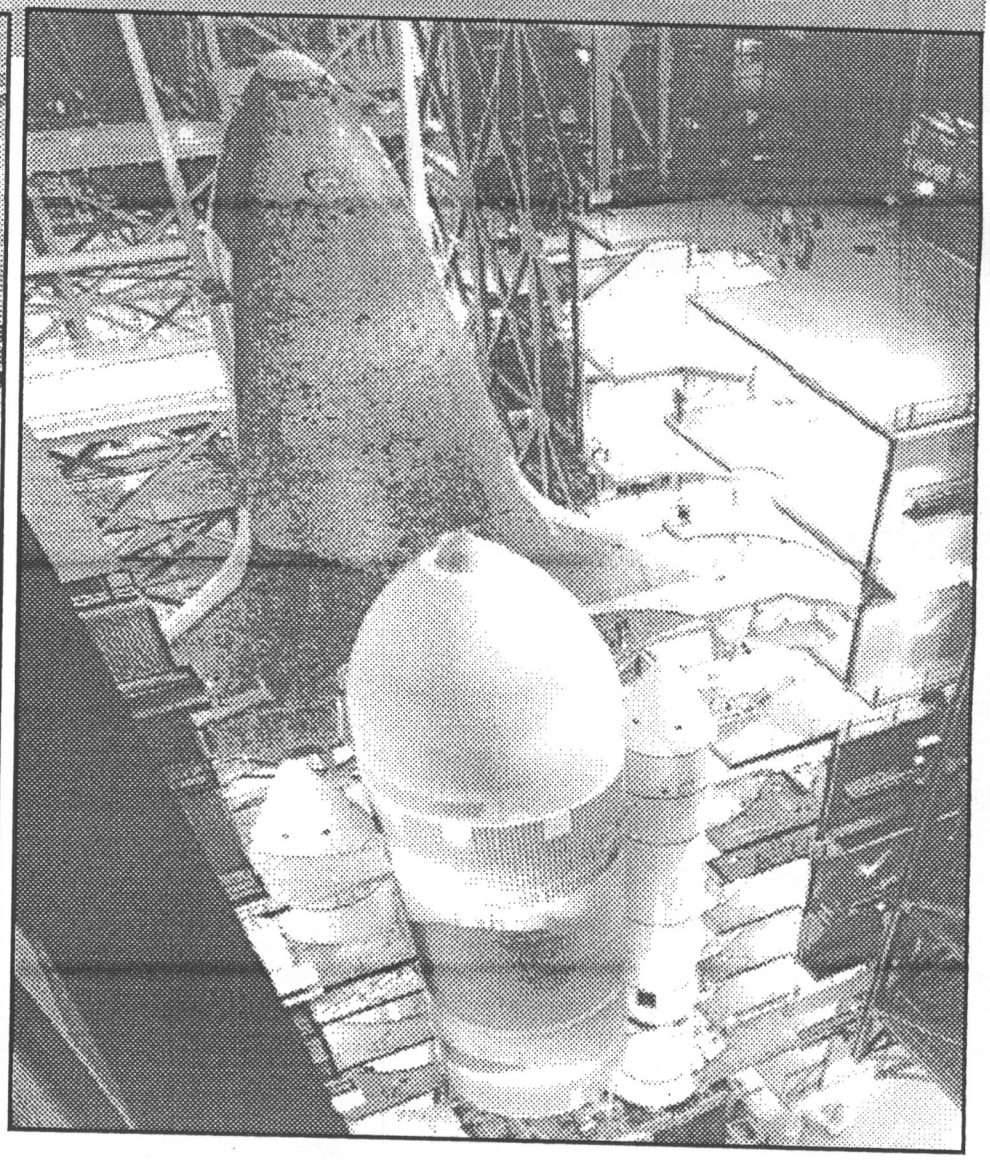




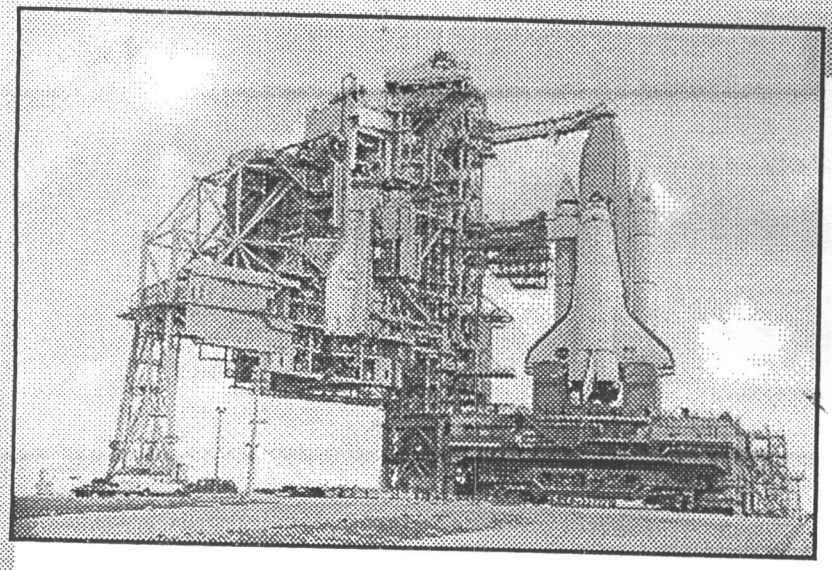


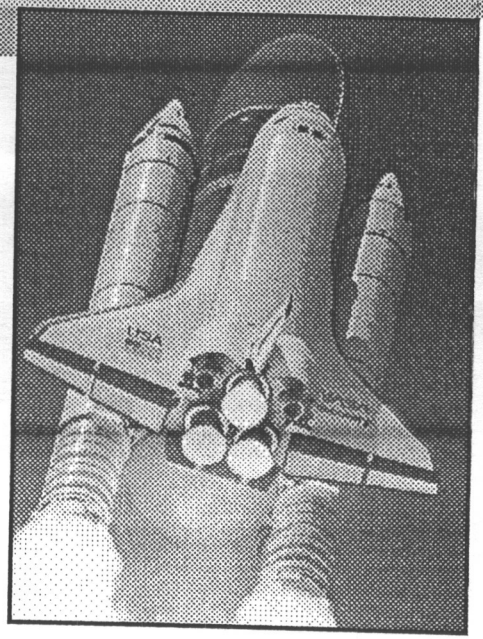
Traceability of Critical Parts

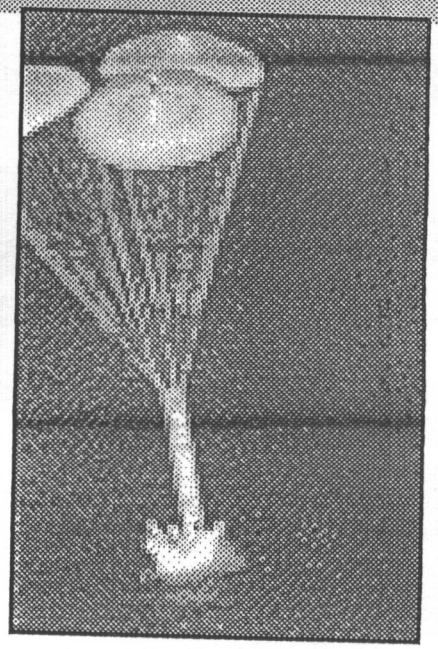


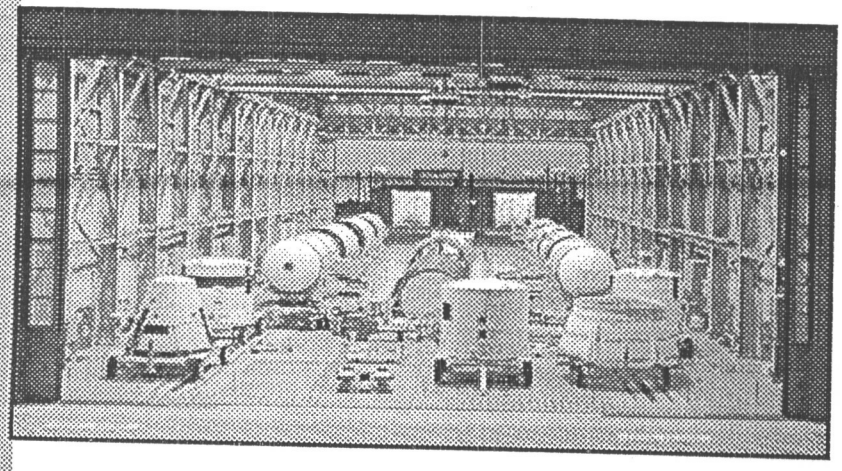


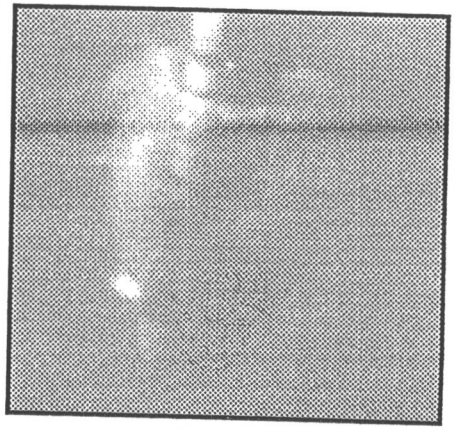
Traceability of Critical Parts

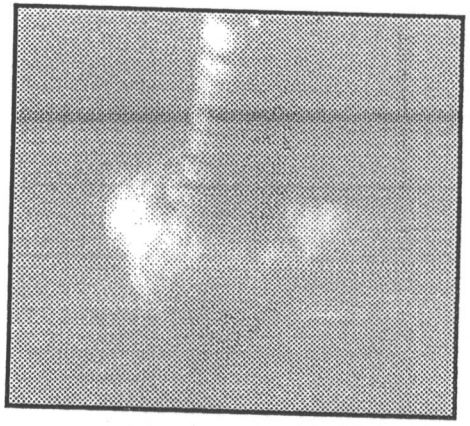












Traceability of Critical Parts Starts with Identification

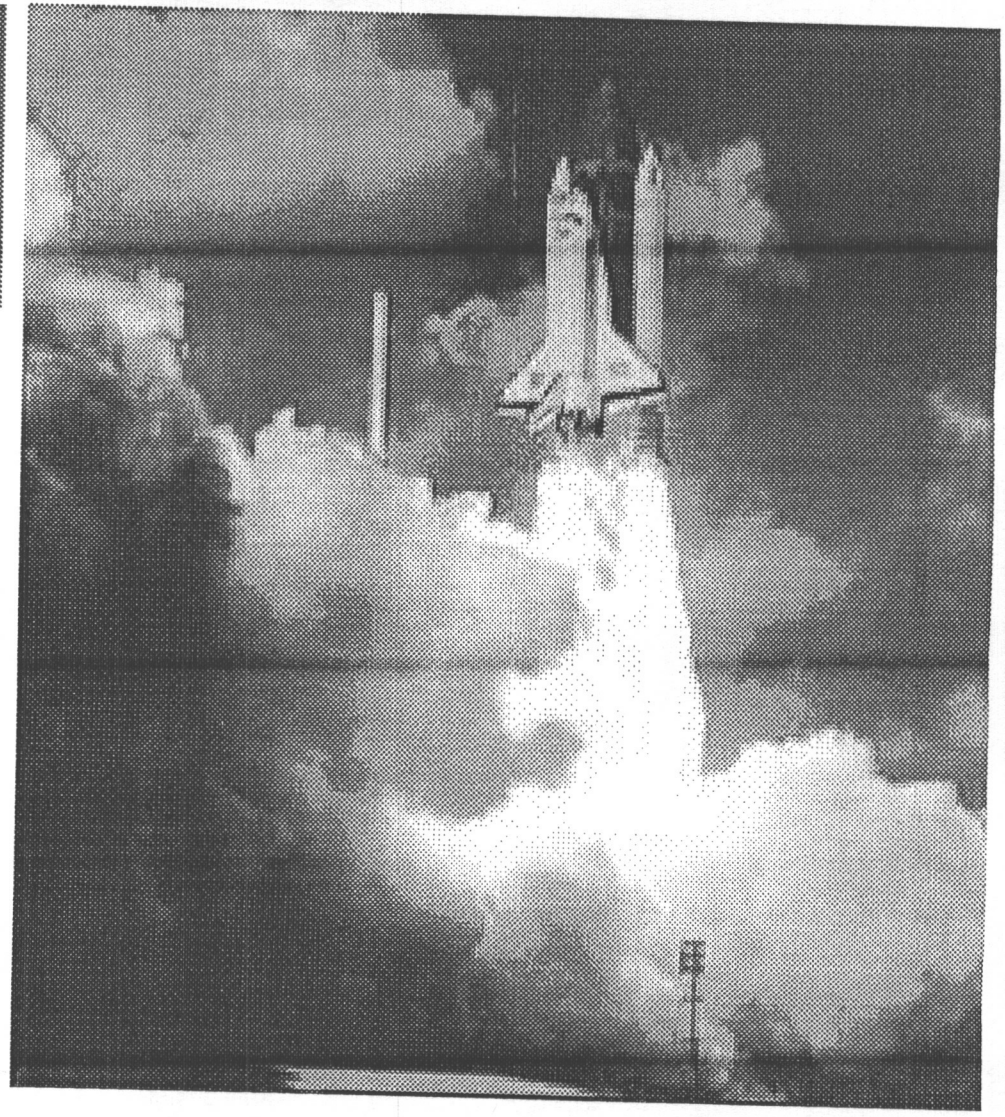
Ford

GM

DAIMLERCHRYSLER

Part Numbers and Serial Numbers Identify One Part From the Other

CAGE Numbers Identify One Supplier from the Other



Automatic Identification Used at Many Levels

Bar Coded Labels That Are Adhered to or Printed on the Product

Direct Part Marked Visible Permanent Identification

Direct Part Marked Hidden Permanent Identification

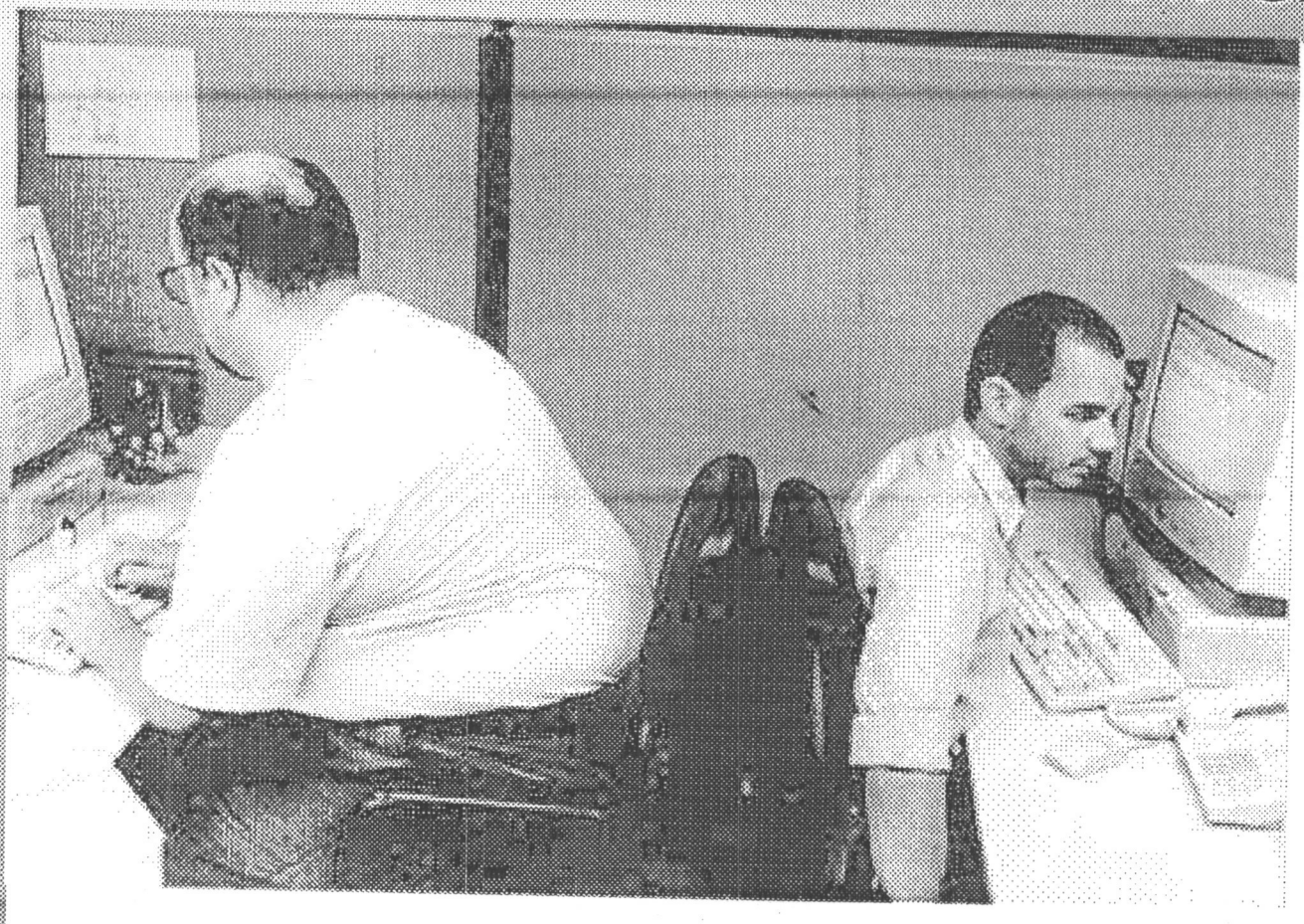
RFID

Intrinsic Identification



All Technologies Must Work Together In the IT World....
Traceability Depends On Automatic Identification Working With Automatic Communication For The Right Results

Automatic Identification Choices



Bar Code Labels Are Cheap... Mature... Reliable... Widely Available Technology

Use Bar Code Labels Where You Can

But If There Is Not Room for a Bar Code Label...Use 2D

Product ID Problems That Inhibited Traceability

- Direct Part Mark 2D Symbols
- No Contrast Marks
- Curved and Shiny Surfaces
- Distance Reads
- Symbols Covered with Paint
- Chemical Tags Not Used as Codes

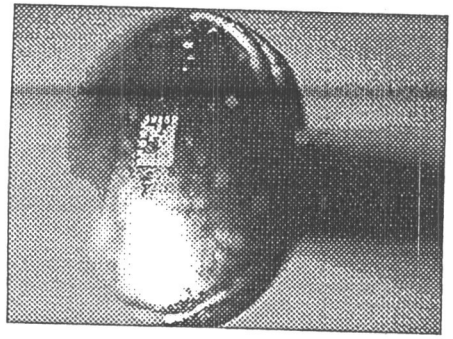
Direct Part Marking

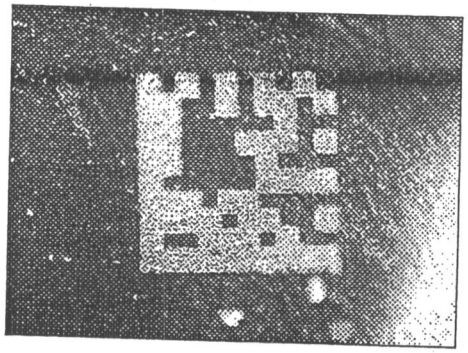
Direct Part Marking

NASA's Primary Emphasis

....Item-Level Traceability

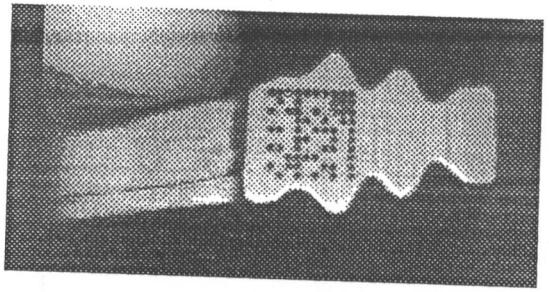
....Track the Piece





Left: 10x10 matrix symbol on the head of a straight pin

Below: 10x10 matrix symbol on the side of a turbine blade



Know the Pedigree

....Know who made it

....Know who marked it

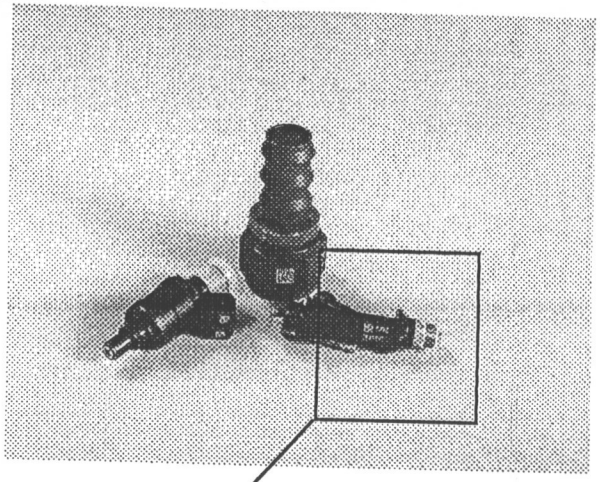
....Know who stands behind it

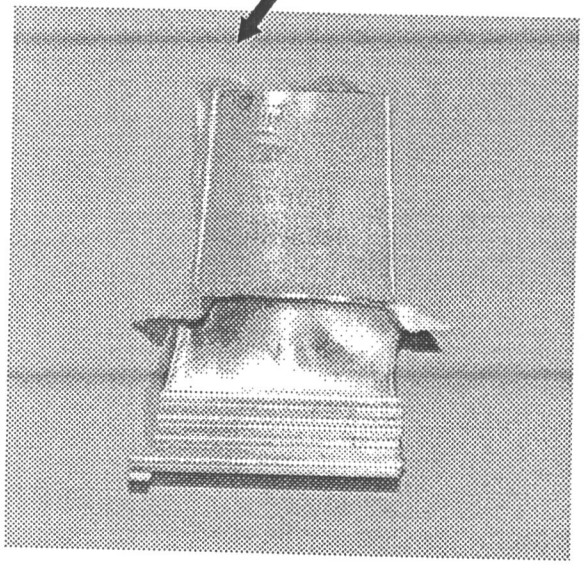
Automatic Identification Starting Points
All ID Must Work Together



Bar Code

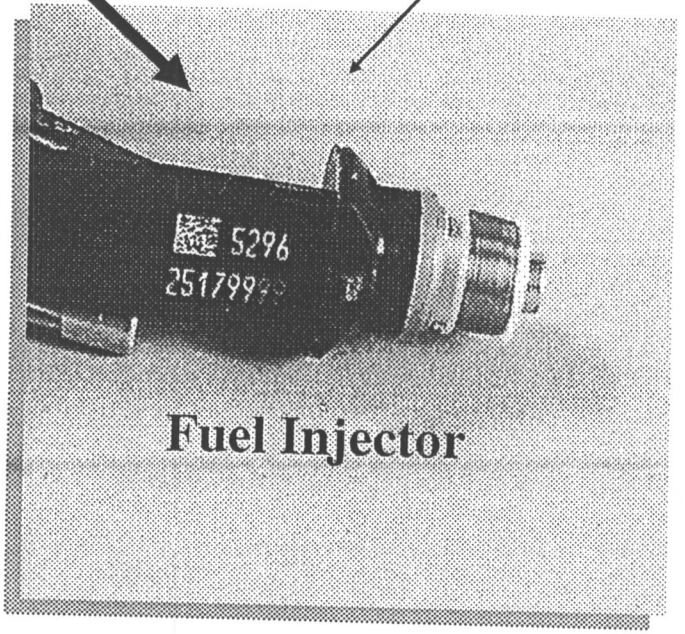
Data Matrix





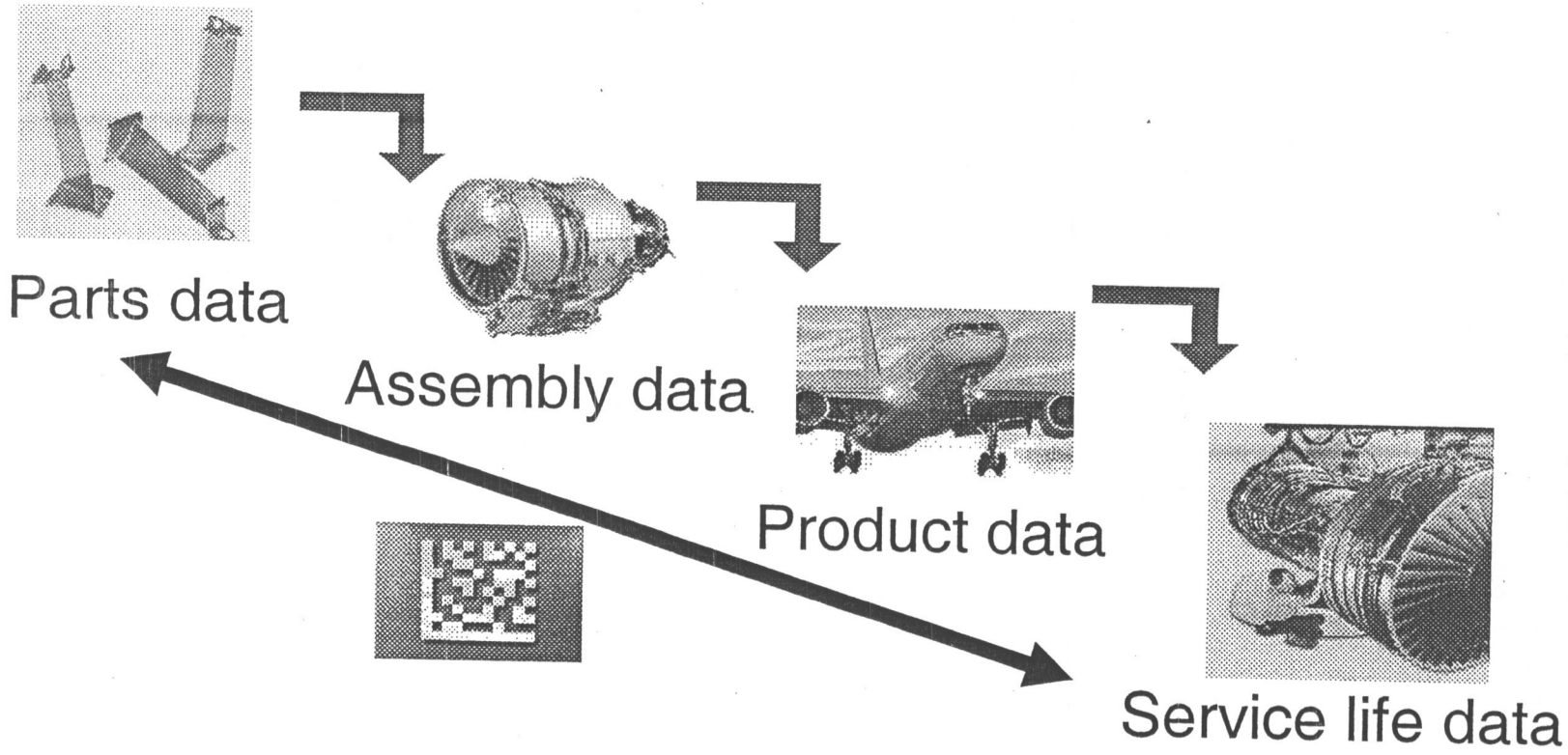
Space Shuttle
Main Engine

Turbine Blade



Fuel Injector

Direct Part Marking Enables Life Cycle Tracking



Data Matrix Codes Marked On The Parts Provide The IT Link

Authentication Technologies

Intrinsic Identification Nanocodes

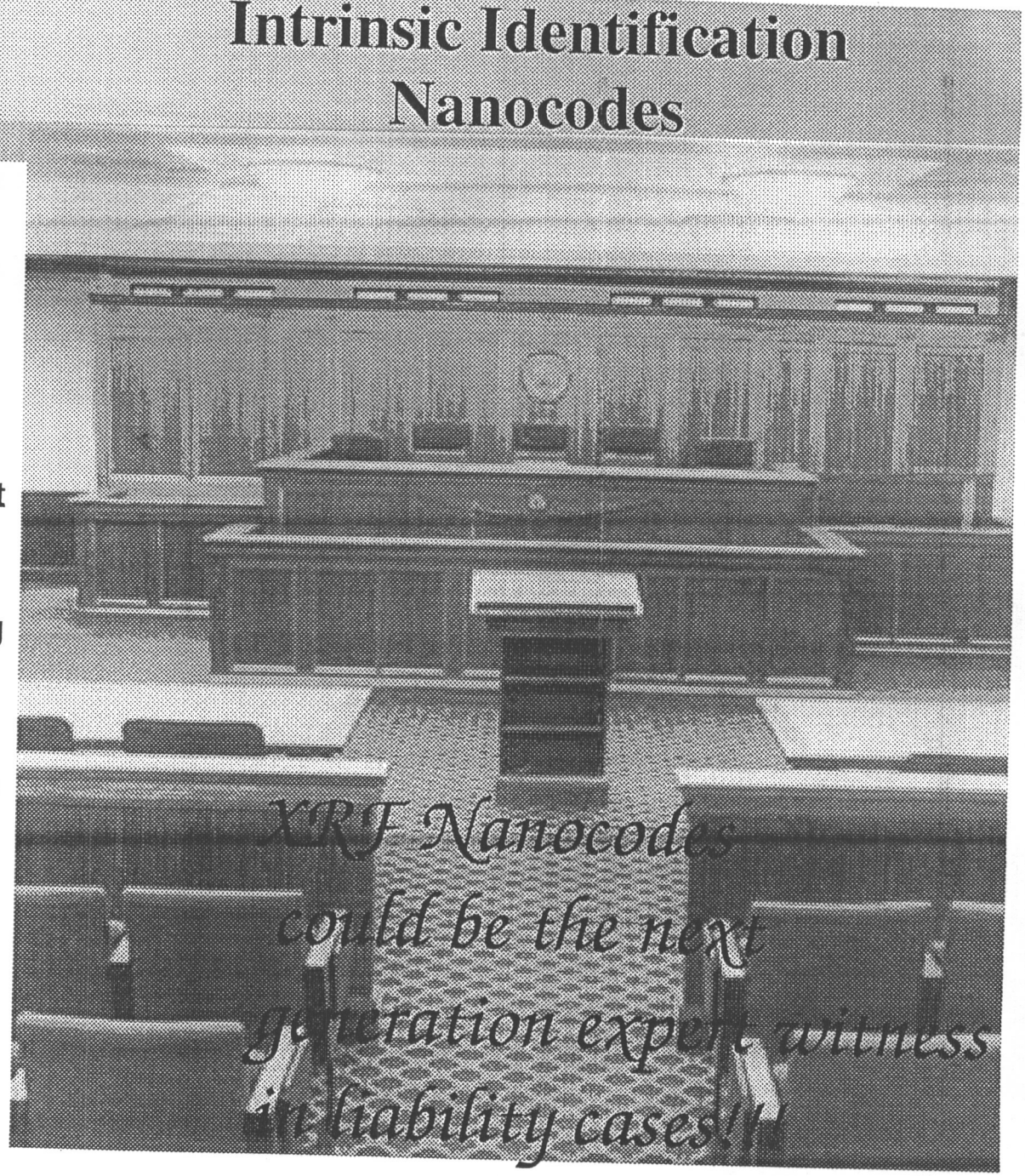
How does an OEM prove that the part that failed was not made by the OEM?

XRF authenticates the product

CAGE Code.....5 Element Tag

XRF converts formats and ties to bar and matrix codes

XRF converted format is transparent to IT systems



RFID Prognostications from VAVD

RFID Tags Will Cost Much Less in Two Years

RFID Combined with Other Technologies Is on the Horizon

RFID Directly on the Part Is on the Horizon

Vacuum Arc Vapor Deposition

Coating Applications

PVC

Composites

Metals

Ceramics

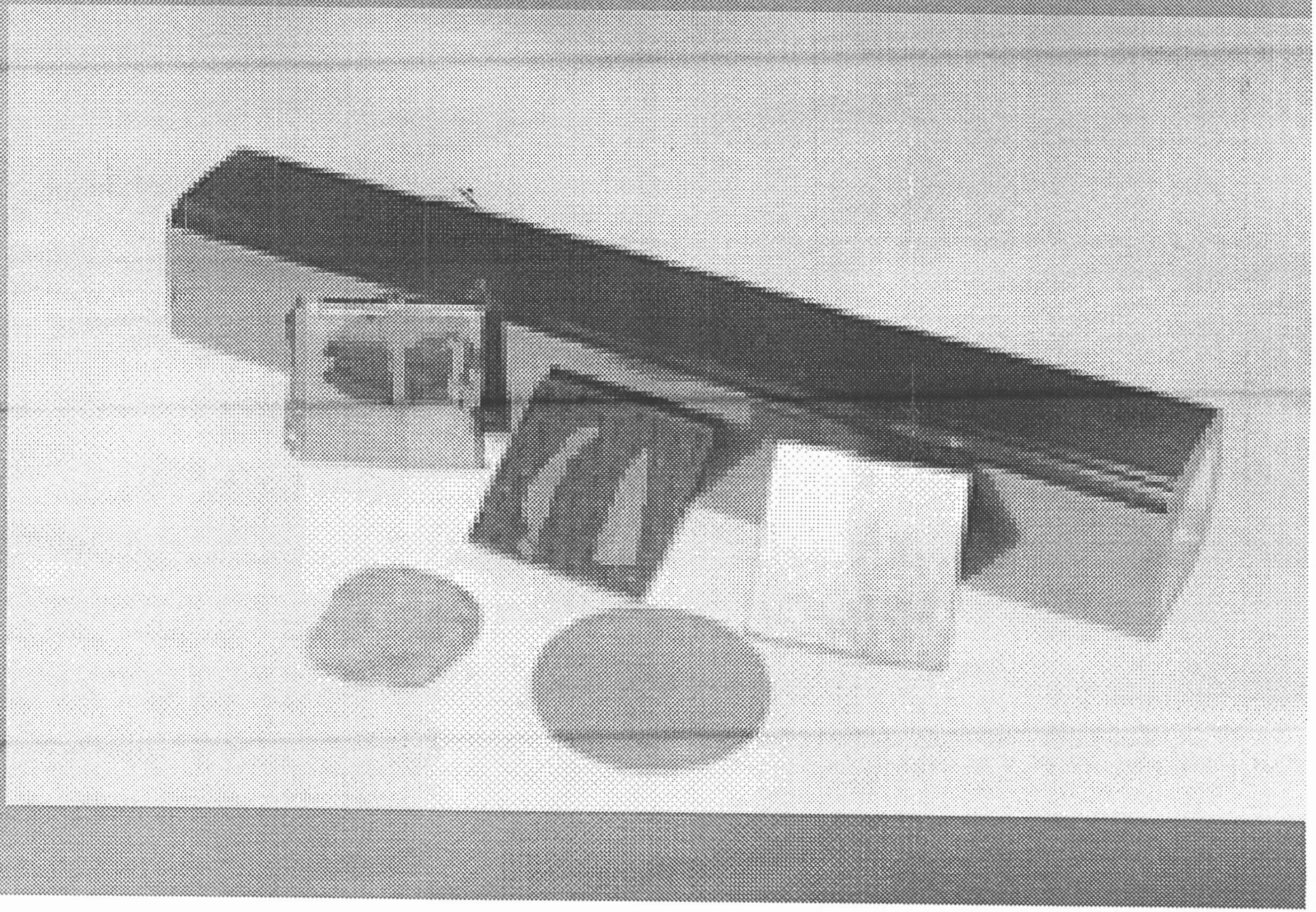
Rocks

Wood

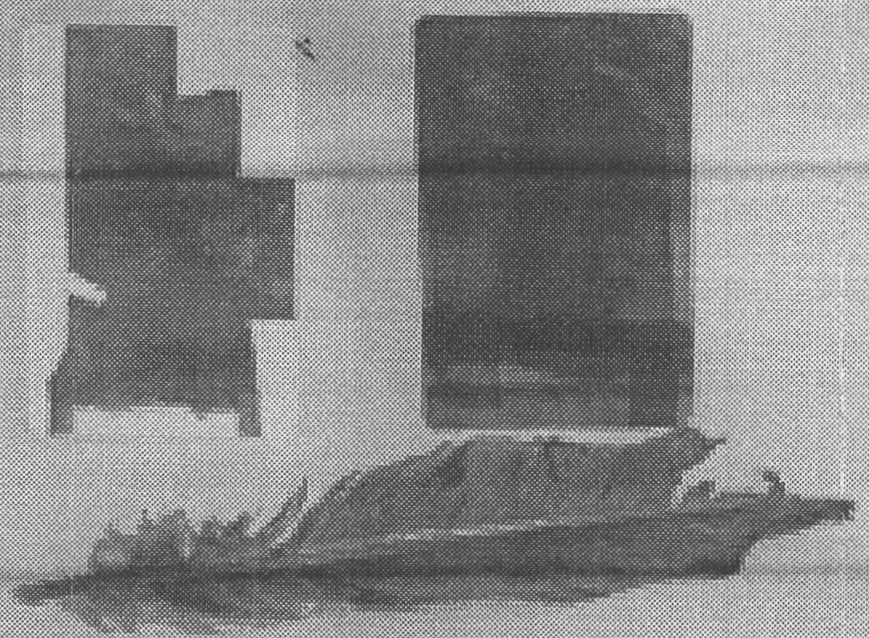
Paper

Glass

Plastics

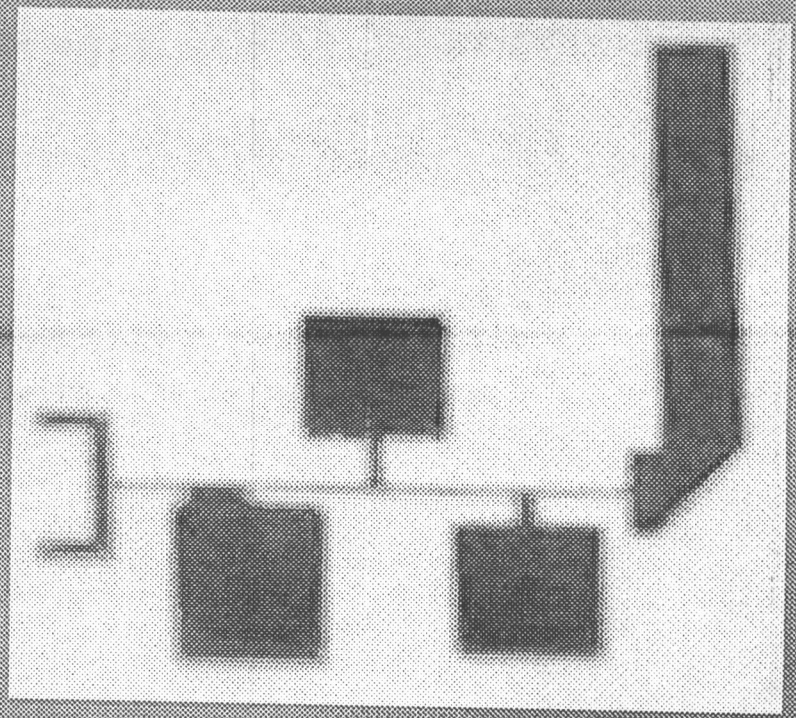


Copper on Credit Card, Stainless, and Feather



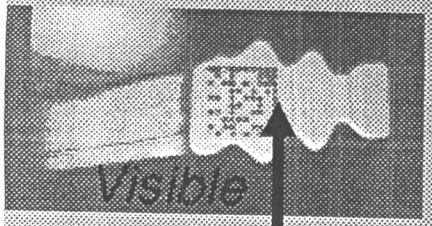
Spray-on Circuits

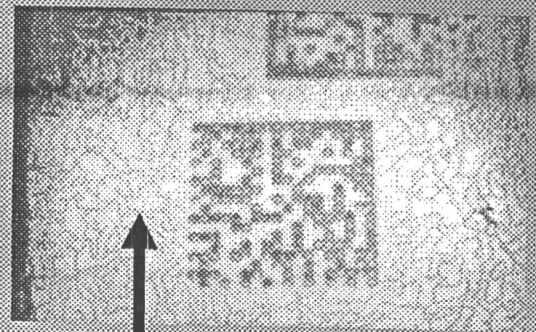
Vacuum Arc Vapor Deposition Spray-on Circuits

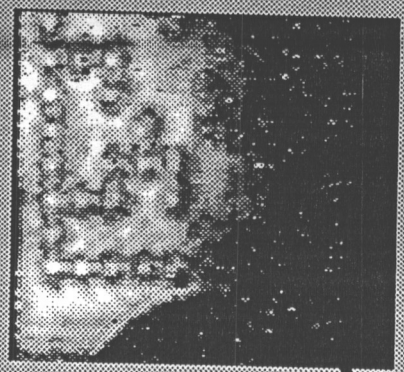


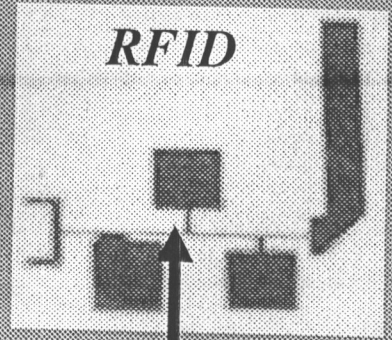
- Apply materials for ultra-thin memory devices (nanometer to microns thick)
- Circuits (replace the matrix symbol mask with a circuit mask)
- Radio frequency tags are first application
- Single layer circuits applied in the field with hand-held (near future—better masks)
- Multi-layer circuits applied under controlled conditions with positioning tooling (requires development and culture shift from subtractive to additive chip making)

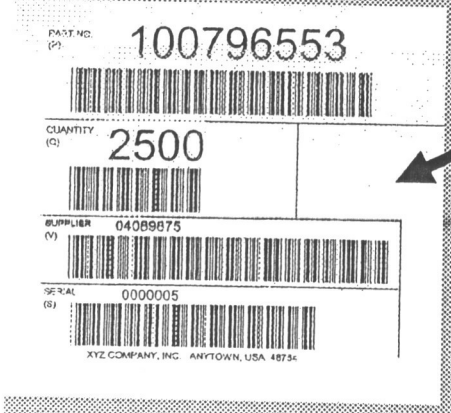
Product Validation and Authentication
Automatic Identification Fully Integrated
(temporary to permanent to intrinsic marks for routine to the most secure product ID and validation matching)



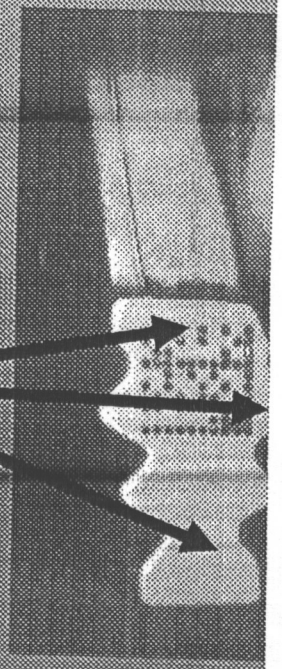












Five Levels of
Auto ID Work Together
Transparent to IT System

Example—Your money shall
not be bent out of shape

Traceability Summary

- Traceability Enables Timely Responses
- Reliable Databases Required
- Reliable Product ID Required
- Reliable Communication Networks Required

Life is NOT like a box of chocolates.
Life is like a jar of jalapenos.
What you do today
May burn your tail tomorrow !

Thank You for the Hospitality



OHIO UNIVERSITY

NASA